(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
25 January 2001 (25.01.2001)

PCT

(10) International Publication Number
WO 01/06578 A3

(51) International Patent Classification[7]: H01M 10/40, 4/02, 4/04

(21) International Application Number: PCT/US00/19348

(22) International Filing Date: 14 July 2000 (14.07.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/144,146 16 July 1999 (16.07.1999) US

(71) Applicant *(for all designated States except US)*: QUALLION, LLC [US/US]; P.O. Box 905, Santa Clarita, CA 91380-9005 (US).

(72) Inventors *(for US only)*: HISASHI, Tsukamoto; 28445 Via Joyce Drive, Saugus, CA 91350 (US). CHANANIT, Sintuu; 15319 Brook Arbor Court, Houston, TX 77062 (US).

(74) Agent: FREILICH, Arthur; P.O. Box 905, Santa Clarita, CA 91380-9005 (US).

(81) Designated States *(national)*: AE, AL, AU, BA, BB, BG, BR, CA, CN, CR, CU, CZ, DM, EE, GD, GE, HR, HU, ID, IL, IN, IS, JP, KP, KR, LC, LK, LR, LS, LT, LV, MA, MG, MK, MN, MX, NO, NZ, PL, RO, SG, SI, SK, TR, TT, UA, US, UZ, VN, YU, ZA.

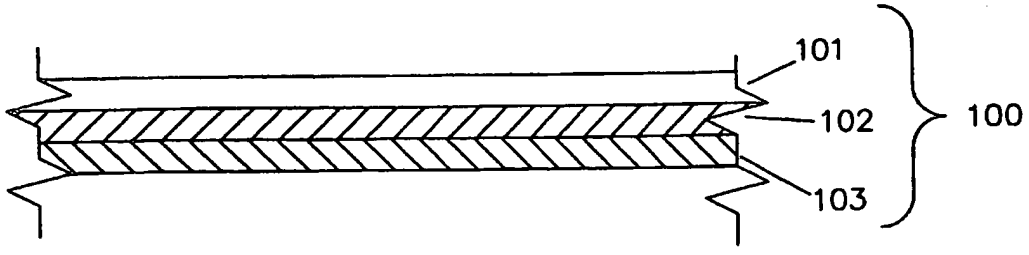
(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

(88) Date of publication of the international search report:
11 October 2001

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: LITHIUM THIN FILM LAMINATION TECHNOLOGY ON ELECTRODE TO INCREASE BATTERY CAPACITY



(57) Abstract: Lithium is laminated onto or into an electrode structure comprising a metal conducting layer with an active material mixture of, for example, a nano-composite of silicon monoxide, together with graphite and a binder, such as polyvinyl di-fluoride (PVDF). The lamination of lithium metal onto or into the electrode structure will reduce the amount of irreversible capacity by readily supplying a sufficient amount of lithium ions to form the initial solid electrolyte interface. In order to laminate lithium metal onto or into the negative electrode, the lithium is first deposited onto a carrier, which is then used to laminate the lithium metal onto or into the electrode structure. The next step is placing the coated electrode material and the lithium-deposited plastic between two rollers or two plates. The rollers or plates are heated to about 120° C or within the range of 25° C to 250° C. A pressure of 50 kg/cm^2 to 600 kg/cm^2 is applied to the rollers. The speed of movement of the materials through the roller pair or the plate pair is in the range of 10 cm/min to 5 m/min. The method can be used for either single-sided or double-sided coating. Using this technology alone, the battery capacity can increase by 7% to 15%.

WO 01/06578 A3

INTERNATIONAL SEARCH REPORT

Inter. ...nal Application No
PCT/US 00/19348

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01M10/40 H01M4/02 H01M4/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H01M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
PAJ, EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 02, 26 February 1999 (1999-02-26) -& JP 10 302839 A (JAPAN STORAGE BATTERY CO LTD), 13 November 1998 (1998-11-13) abstract ---	1-4
A	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 09, 30 July 1999 (1999-07-30) -& JP 11 111267 A (TOYOTA MOTOR CORP), 23 April 1999 (1999-04-23) abstract --- -/--	1,7

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
2 May 2001	09/05/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Riba Vilanova, M

1

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Interr. nal Application No
PCT/US 00/19348

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	WO 96 27908 A (UNIV RAMOT ;SHOSHAN HERBERT Z (IL); PELED EMANUEL (IL); MENACHEM C) 12 September 1996 (1996-09-12) page 1, line 3 -page 2, line 21 page 4, line 5 - line 20	1,7
A	DE 198 39 244 A (SAMSUNG DISPLAY DEVICES CO LTD) 18 March 1999 (1999-03-18) page 1, line 19 - line 58	1,7
A	CA 2 203 490 A (HYDRO QUEBEC) 23 October 1998 (1998-10-23) the whole document	1-6

1

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

Intern nal Application No
PCT/US 00/19348

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 10302839 A	13-11-1998	NONE	
JP 11111267 A	23-04-1999	NONE	
WO 9627908 A	12-09-1996	AU 5304696 A	23-09-1996
DE 19839244 A	18-03-1999	GB 2328786 A	03-03-1999
		JP 11126633 A	11-05-1999
CA 2203490 A	23-10-1998	CA 2235884 A	23-10-1998
		EP 0875952 A	04-11-1998
		JP 11097065 A	09-04-1999
		US 6030421 A	29-02-2000